8-1978

Comparison of the Peabody Picture Vocabulary Test and the Stanford-Binet Intelligence Scale in School Age Children

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COMPARISON OF THE PEABODY PICTURE VOCABULARY TEST AND THE STANFORD-BINET INTELLIGENCE SCALE IN SCHOOL AGE CHILDREN

A Thesis

Presented to

the Faculty of the Department of Psychology

Western Kentucky University

Bowling Green, Kentucky

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Stephen C. Skiles

August, 1978

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IN SCHOOL AGE CHILDREN

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Acknowledgements

I would especially like to thank my graduate advisor, Dr. David Shiek, for the encouragement, interest, and patience he has shown, not only in regard to this paper, but also throughout my graduate training.

Dr. Clinton Layne has also been most helpful in the production of this paper and throughout the course of my graduate training.

Dr. Ron Adams deserves a special thanks for serving on my committee and for being my assistantship supervisor. I have learned much about the basics of research methodology by working for him.

I would also like to thank my typist and proofreader, Mary Overstreet. Without her unselfish support, this project would have taken considerably longer than it has.

Lastly, I would like to express my deepest gratitude to my wife, Paula, and to my daughter, Allison, for their continual support during this sometimes trying period of our lives.

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IN SCHOOL AGE CHILDREN

Stephen C. Skiles August 1978 23 pages

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The correlate relationships and directionality and magnitude of mean differences between MAs and IQs of the Peabody Picture Vocabulary Test and the Revised Stanford-Binet Intelligence Scale (both 1960 and 1972 norms) were investigated in a sample of 225 school age children. It was found that MAs of two instruments were more highly correlated than the IQs. For the total sample, no significant differences were found between mean MAs of the two instruments. The correlation between PPVT and the 1960 Revised Stanford-Binet IQs and the correlation between PPVT and 1972 Revised Stanford-Binet IQs were found to be identical. The PPVT was found to consistently overestimate both 1960 and 1972 Revised Stanford-Binet IQs. The 1972 restandardization of the Stanford-Binet appears to have increased the difference in IQs of the two instruments. It is suggested that the PPVT be used for screening purposes only and even then with caution. It is also suggested that the PPVT be restandardized on a sample more representative of the U. S. population in order to improve its efficiency in predicting Stanford-Binet IQs.

Introduction

The Peabody Picture Vocabulary Test (PPVT) has been widely utilized as a tool for measuring the vocabulary intelligence of both mentally subnormal and average subjects. The PPVT is popular for several reasons. The administration of the PPVT requires no special training other than familiarity with the test materials and procedures described in the manual (Dunn, 1965). The test can usually be administered in 10 to 15 minutes and is completely untimed, thus making it a power rather than a speed test. The scoring of the test is completely objective and can be accomplished in one or two minutes. The subject is not required to read, write or make oral responses, but only to indicate which one of the four drawings on a page best illustrates the word the examiner has orally presented. According to Dunn (1965), the PPVT may be given to any English speaking subject between the ages of 2 years 6 months and 18 years who is able to hear words, see the drawings, and has the facility to indicate yes or no in a manner that communicates. These features of the PPVT make it an instrument especially suited to the evaluation of preschool children, the speech impaired, and subjects who are functioning in the lower ranges of intellectual ability.

The PPVT was standardized in 1959 using 4012 Caucasian subjects between the ages of 2 years 6 months and 18 years who resided in or around Nashville, Tennessee. Norms were established that could yield either a mental age (MA) or a deviation IQ. The possible MAs that could

be obtained range from 1 year 9 months to 18 years. The possible IQs range from 10 to 175 with a mean of 100 and a SD of 15.

The PPVT has often been used as a screening test to indicate if the administration of one of the more global and exhaustive measures of mental ability is warranted. The Stanford-Binet Intelligence Scale is one such global measure which has shaped the prevalent conception of the construct of intelligence and which has often served as the criterion for validating other intelligence tests (Anastasi, 1968). In contrast to the PPVT, however, the Stanford-Binet was restandardized in 1972 on a nationwide sample considered representative of the United States population (Terman and Merrill, 1973). In the 1972 restandardization, the level of performance for obtaining any given MA remains exactly the same as that required in the previous 1960 Revision. However, different distributions of ability were found in the 1972 restandardization group, necessitating that the traditional relationship between MA, CA, and IQ be altered to account for these differences. For example, a child who achieves an MA of 5-0 on his fifth birthday does not receive an IQ of 100 as he would were the 1960 Revision tables used, but rather an IQ of 91. In order to be credited with an IQ of 100, he must achieve an MA of 5-6. These shifts in the performance level necessary to obtain a given IQ have altered the relationship between IQs of the two tests to an unknown extent. Since the PPVT and Stanford-Binet are often used in conjunction with one another, it should be of particular interest and utility to compare the similarity of these two measures of mental ability, especially in light of the 1972 restandardization of the Stanford-Binet.

Literature Review

Since the development of the PPVT, many studies have explored its relationship with the Stanford-Binet. Most of these studies involved restricted populations of retarded or preschool children. Dunn and Brooks (1960) compared PPVT and Stanford-Binet (1937 Revision) IQs and MAs in a group of educable mentally retarded pupils between the ages of 6-5 and 18-0. The correlation between the IQs was found to be .36 while the MA correlation was found to be .76. In 1961 Dunn and Hottel found a somewhat lower but significant .66 correlation between the MAs of the PPVT and the 1937 Revised Stanford-Binet in a group of trainable mentally retarded children between the ages of 6 and 16.

Mein (1962) compared the mean MAs for the PPVT and the 1937 Revised Stanford-Binet in a group of 80 institutionalized trainable mentally retarded subjects between the ages of 10 and 30. The mean MA for the PPVT was found to be significantly lower than the mean MA for the Stanford-Binet in the subjects who obtained a PPVT MA of less than 4-7. Conversely, in the subjects whose PPVT MA exceeded 5-11, the mean PPVT MA was found to be significantly higher than the mean Stanford-Binet MA.

Budoff and Purseglove (1963) investigated this phenomenon in a group of 46 mentally retarded adolescent subjects between the ages of 16 and 18. They found that subjects whose PPVT MA was lower than 8-0 tended to score lower on PPVT MA than Stanford-Binet (1937 & 1960 Revised) MA. Whether this mean difference was statistically significant was not

reported. Though the mean MAs for the two measures were found to be different for subjects with PPVT MAs below 8-0, a significant .80 correlation between them was found. In subjects whose PPVT MA exceeded 8-0, the correlation between MAs was found to be non-significant at .34. Budoff and Purseglove recommended extreme caution when trying to predict Stanford-Binet MAs for subjects whose PPVT MA exceeds 8-0.

The tendency for the PPVT MA to overestimate the Stanford-Binet MA in subjects with higher MAs was again found in a study by Throne, Kaspar, and Schulman (1965). In a group of 35 institutionalized educable mentally retarded boys between the ages of 11 and 14, a significant difference in mean MAs was found with the mean PPVT MA being 6.57 months higher than the mean 1937 Revised Stanford-Binet MA.

In a study of 152 institutionalized trainable and educable mentally retarded subjects between the ages of 7 and 49, Koh and Madow (1967) further investigated the relationship between the MAs that are yielded by the two tests. Subjects whose PPVT MAs were below 5-0 obtained mean Stanford-Binet MAs that were significantly higher than the mean PPVT MA. Comparing the 5-0 and 9-6 PPVT MA level, no significant differences were found between the mean MAs. Above the 9-6 MA level, the mean PPVT MA was found to exceed the mean Stanford-Binet MA by 24.5 months. Ninety-eight percent of the subjects whose PPVT MA was greater than 9-6 obtained a PPVT MA that exceeded their Stanford-Binet MA. Though significant differences were found between the mean PPVT and Stanford-Binet MAs in the lower and upper portions of the MA distribution, the correlation of .93 between the two MAs for the total group was significant. Koh and Madow cautioned that this high correlation was partially the result of the wide range in ages of their subjects.

Mean differences between PPVT and Stanford-Binet IQs have been reported in many studies. In a sample of 29 Headstart children, Johnson and Johnson (1971) compared PPVT and Stanford-Binet IQs. Though a .79 correlation was found between the IQs, a significant difference was found between the mean IQs. The PPVT IQ was found to underestimate the Stanford-Binet IQ by 11 points. These results are consistent with those of several other studies of pre-schoolers which have shown the PPVT to give generally lower IQs than the Stanford-Binet (Milgram & Ozer, 1967; Di Lorenzo & Brady, 1968; Staffieri, 1971; Payne, Ball, & Stainbeck, 1972; Ritter, Duffy, & Fishman, 1974; Groden, Branson, & Mann, 1976).

Rice and Brown (1967) found significant differences between mean IQs of the two tests in a sample of 73 educable mentally retarded children between the ages of 5-7 and 13-11. The mean PPVT IQ was found to be 5.5 points higher than the Stanford-Binet (1937 Revision) IQ. PPVT and Stanford-Binet IQs were found to have a relatively low correlation of .40. Rice and Brown concluded the PPVT was not substantially predictive of individual intelligence as measured by the Stanford-Binet. In other studies, Brown and Rice (1967), Zunich and Tolley (1968), and Wolf (1971) also found the mean PPVT IQ was significantly higher than the mean Stanford-Binet IQ in mentally retarded subjects. These studies and other studies by Hammil (1965) and Mueller (1968) found correlations between IQs of the two instruments to fall in the .40 to .59 range.

In contrast to the previously mentioned studies, Kicklighter (1966) found no significant differences between the means of either the IQs or MAs in a sample of 66 mentally retarded subjects between the ages of 6-7 and 16-4. Stanford-Binet (1960 Revision) and PPVT IQs were found to

have a correlation of .71. The correlation between MAs was found to be .87. Kicklighter concluded from his results that the PPVT is a valid instrument to screen the intelligence of the mentally retarded. Similar findings were reported by McArthur and Wakefield (1968) and Shotwell (1969).

A wide range of MA and IQ correlation coefficients for the two instruments have been reported in the studies cited. MA correlation coefficients have ranged from .66 to .93 while IQ correlation coefficients have tended to be somewhat lower, ranging from .36 to .80. Generally, the higher MA and IQ correlations have been reported by the studies which had the greatest variability in the CA, MA, or IQ in their samples. Conversely, studies which have reported lower variability in these three variables tended to show the lowest MA and IQ correlations. Another possible reason offered by Dunn and Brooks (1960) for the lower correlations between PPVT and 1937 Revised Stanford-Binet IQs is that the PPVT uses a deviation IQ while the 1937 Revised Stanford-Binet used a ratio IQ.

Most of the studies have reported significant differences between the mean MAs and IQs obtained on the two tests. With few exceptions, the PPVT has been reported as underestimating Stanford-Binet MAs and IQs in preschool children and the lower functioning mentally retarded. Above these levels of functioning, most studies have reported the PPVT to overestimate Stanford-Binet MAs and IQs.

No studies of school age subjects were found in the literature which investigated the relationship between the PPVT and the more recent 1972 restandardization of the Stanford-Binet. It was the purpose of this study to investigate the correlate relationships and the directionality

of mean differences between PPVT and the Stanford-Binet MAs, and to see if the 1972 restandardization has changed the relationship between IQs of the two instruments.

Method

The sample was composed of students between the ages of 6 years and 14 years 11 months who had been referred to the Psychological Clinc at Western Kentucky University. The referrals were made for a wide variety of reasons including questions pertaining to grade placement, behavioral and emotional problems, and routine testing of normal children for training purposes. From an original sample of 1062 students, 225 students were selected who had concurrent administrations of both the PPVT and the 1960 Revised or 1972 Revised Stanford-Binet. There were 138 males and 87 females included in the sample with a mean chronological age of 9 years 11 months and a SD of 2 years 5 months. The sample included 81 white, 50 black, and 94 children whose race had not been recorded. The sample was not designed to be descriptive of the general population but was felt quite similar to the clinical population with which the PPVT and Stanford-Binet are frequently used.

Each student was individually administered the PPVT and the Stanford-Binet by a graduate student in the two-year clinical psychology program at Western Kentucky University. The testing sessions were supervised and observed by doctoral level psychologists. Standardized procedures were followed for all administrations and scoring was in accordance with the PPVT manual (Dunn, 1965) and the Stanford-Binet manual (Terman and Merrill, 1973). MA and IQ scores were recorded for both the PPVT and the Stanford-Binet. For each Stanford-Binet administration, however, two IQ scores

were recorded. One IQ score was taken from the 1960 norms while the other IQ score was taken from the 1972 norms.

The total group of 225 was arbitrarily subdivided into three subgroups on the basis of chronological age. The first subgroup was composed of 93 subjects aged 6, 7, or 8. The second subgroup was composed of 72 subjects aged 9, 10, or 11. The third subgroup was composed of 60 subjects aged 12, 13, or 14.

Pearson Product Moment Correlations were performed for the following pairs of variables for the total group and the three subgroups; PPVT MA and Stanford-Binet MA, PPVT IQ and 1960 Revised Stanford-Binet IQ, PPVT IQ and 1972 Revised Stanford-Binet IQ. Correlated t-tests were also calculated between the means of the following pairs of variables for the total group and the three subgroups; PPVT MA and Stanford-Binet MA, PPVT IQ and 1960 Revised Stanford-Binet IQ, PPVT IQ and 1972 Revised Stanford-Binet IQ. Since the standard deviations of the IQs of the PPVT and the Stanford-Binet differ by one point (i.e. 15 and 16), any small differences found between mean IQs could have been an artifact of the discrepant standard deviations. To correct for this, PPVT IQ scores were converted into standard scores having a standard deviation of 16; equal to the Stanford-Binet IQ. Correlated t-tests were then run between the means of the following pairs of variables for the total group and the three subgroups; converted PPVT IQ and 1960 Revised Stanford-Binet IQ, converted PPVT IQ and 1972 Revised Stanford-Binet IQ. Significance levels of .05 were used for all statistics.

Results and Discussion

As can be seen in Tables 1-5, the PPVT and Stanford-Binet IQ means fell below the standardization mean of 100 but were still in the Low Average range of intelligence. Even though the sample was below average in their performance on the two tests, very little restriction of variance was evident. IQ standard deviations for both tests exceeded 13 in all age groups.

Pearson Product Moment correlations between PPVT and 1960 Revised Stanford-Binet IQs, PPVT and 1972 Revised Stanford-Binet IQs, and PPVT and Stanford-Binet MAs are presented in Tables 1, 3, and 5 respectively. All correlations in this study were significant beyond the .05 level. For the total sample, 1960 and 1972 Revised Stanford-Binet IQs had the same correlation coefficient with PPVT IQs. The 12, 13, and 14 year age group had the highest correlations between the two tests but also had the most variance in IQ scores. Pearson Product Moment correlations between PPVT and Stanford-Binet MAs tended to run somewhat higher than the correlations between IQs, with the 12, 13, and 14 year age group again having the highest correlations.

The results of *t* tests between means of PPVT and 1960 Revised Stanford-Binet IQs, converted PPVT and 1960 Revised Stanford-Binet IQs, PPVT and 1972 Revised Stanford-Binet IQs, converted PPVT and 1972 Revised Stanford-Binet IQs, and PPVT and Stanford-Binet MAs are presented in Tables 1-5 respectively. In all cases, mean IQs for the PPVT exceeded

Table 1

Summary of Statistical Findings
Comparing PPVT and 1960 Revised Stanford-Binet IQs

AGE GROUP	TEST	MEAN IQ	SD	DIFF	SIG	r
6,7,8	BINET	87.19	15.54	1.12	.410	.602
	PPVT	88.31	13.38			
9,10,11	BINET	75.85	13.78	4.11	.011	.588
	PPVT	79.96	15.56			
12,13,14	BINET	72.22	17.79	3.07	.105	.730
	PPVT	75.28	20.70			
TOTAL	BINET	79.57	16.91	2.60	.004	.683
	PPVT	82.16	17.13			

Table 2

Summary of Statistical Findings
Comparing Converted PPVT IQs and 1960 Revised Stanford-Binet IQs

AGE GROUP	TEST	MEAN IQ	SD	DIFF	SIG
6,7,8	BINET	87.19	15.54	.34	.808
	PPVT	87.53	14.27		
9,10,11	BINET	75.85	13.78	2.78	.098
	PPVT	78.62	16.63		
12,13,14	BINET	72.22	17.79	1.42	.472
	PPVT	73.64	22.08		
TOTAL	BINET	79.57	16.91	1.41	.135
	PPVT	80.97	18.27		

Table 3

Summary of Statistical Findings
Comparing PPVT and 1972 Revised Stanford-Binet IQs

AGE GROUP	TEST	MEAN IQ	SD	DIFF	SIG	r
6,7,8	BINET	84.59	14.81	3.72	.006	.600
	PPVT	88.31	13.38			
9,10,11	BINET	75.10	13.02	4.86	.002	.608
	PPVT	79.96	15.59			
12,13,14	BINET	70.95	17.37	4.33	.026	.716
	PPVT	75.28	20.70			
TOTAL	BINET	77.92	16.04	4.25	.000	.683
	PPVT	82.16	17.13			

Table 4

Summary of Statistical Findings
Comparing Converted PPVT IQs and 1972 Revised Stanford-Binet IQs

AGE GROUP	TEST	MEAN IQ	SD	DIFF	SIG
6,7,8	BINET	84.59	14.81	2.94	.032
	PPVT	87.53	14.28		
9,10,11	BINET	75.10	13.02	3.52	.030
	PPVT	78.62	16.63		
12,13,14	BINET	70.95	17.37	2.69	.184
	PPVT	73.64	22.08		
TOTAL	BINET	77.92	16.04	3.06	.001
	PPVT	80.97	18.27		

Table 5

Summary of Statistical Findings
Comparing PPVT and Stanford-Binet MAs

AGE GROUP	TEST	MEAN MA*	SD	DIFF	SIG	r
6,7,8	BINET	81.46	15.00	-2.90	.043	.662
	PPVT	78.56	17.69			
9,10,11	BINET	93.83	18.66	.74	.766	.603
	PPVT	94.57	25.94			
12,13,14	BINET	109.63	29.67	-2.32	.470	.710
	PPVT	107.32	33.79			
TOTAL	BINET	92.93	23.75	-1.58	.222	.731
	PPVT	91.35	27.97			

* Given in months

the Stanford-Binet. For the total sample, there was a significant difference between the means of the PPVT and the 1960 Revised Stanford-Binet IQs (see Table 1). Of the three individual age groups, however, only the 9, 10, and 11 year age group had a significant difference between the means of the PPVT and the 1960 Revised Stanford-Binet IQs. When PPVT IQs were converted into standard score units having the same SD as the Stanford-Binet IQs, there were no significant differences between the means of the PPVT and the 1960 Revised Stanford-Binet IQs (see Table 2) for the total sample or in any of the age groups.

When PPVT and 1972 Revised Stanford-Binet IQs were compared (see Table 3), significant differences between means of the two tests were found for the total sample and all age groups. The magnitude of this difference was greater for the 1972 Revised Stanford-Binet than for the 1960 Revised. The greatest change in the mean differences appeared in the 6, 7, and 8 year age group. Mean PPVT IQs exceed the mean 1960 Revised Stanford-Binet IQ by only 1.12 points in this age group but exceed the mean 1972 Revised Stanford-Binet IQ by 3.72 points. Even when PPVT IQ scores were converted to standard scores equivalent to the Stanford-Binet (see Table 4), there were still significant differences between mean IQs of the two instruments for the total sample and in all age groups but the 12, 13, and 14 year age group.

The mean difference between PPVT and Stanford-Binet MAs (see Table 5) was significant in only the 6, 7, and 8 year age group. In contrast to the IQs, mean Stanford-Binet MAs exceeded mean PPVT MAs in all age groups but the 9, 10, and 11 year age group. The mean difference between PPVT and Stanford-Binet MAs was significant in only the 6, 7, and 8 year age group.

To summarize, it would appear the correlation coefficients between PPVT and 1960 Revised Stanford-Binet IQs, and the PPVT and 1972 Revised Stanford-Binet IQs, have remained roughly the same. There appears to be more tendency for the PPVT to overestimate 1972 Revised Stanford-Binet IQs than there was for the PPVT to overestimate 1960 Revised Stanford-Binet IQs. Converting PPVT IQs to standard scores with the same SD as the Stanford-Binet eliminated significant mean differences between IQs of the PPVT and 1960 Revised Stanford-Binet. This is not the case with the 1972 Revised Stanford-Binet as this conversion eliminates significant mean differences in only the 12, 13, and 14 year age group. It would appear that the discrepancy between PPVT and Stanford-Binet IQs have increased with the 1972 restandardization of the Stanford-Binet. Although these mean IQ differences are statistically significant, in no case do mean PPVT IQs exceed mean 1972 Revised Stanford-Binet IQs by over 5 points. The MAs of the two instruments have a higher correlation than the IQs and only in the 6, 7, and 8 year age group are there significant differences between the mean MAs of the two instruments.

Summary and Implications

The purpose of the study was to investigate the correlate relationships and directionality and magnitude of mean differences between MAs and IQs of the PPVT and the Stanford-Binet, and to see if the 1972 restandardization of the Stanford-Binet has changed the relationship between IQs of the two instruments. Correlation analysis has indicated significant though moderate relationships between MAs and IQs of the two instruments.

The correlation between MAs of the PPVT and Stanford-Binet for the total sample is less than that reported by Dunn and Brooks (1960), Kicklighter (1966), Koh and Madow (1967), and McArthur and Wakefield (1968), but is greater than the correlations reported by Dunn and Hottel (1960), and Budoff and Pursegl̈ove (1963).

The finding that MAs of the two instruments were more highly correlated than the IQs was consistent with previously reported studies (Dunn and Brooks, 1960; Dunn and Hottel, 1961; Kicklighter, 1966; McArthur and Wakefield, 1968). It should be noted that the distribution of MA scores in this sample had more variance than the distribution of IQ scores. This factor could have contributed to the higher MA correlation and should be considered before assuming that the PPVT is better at predicting Stanford-Binet MAs than IQs.

For the total sample, no significant difference was found between mean MAs of the two instruments. This finding does not support studies

by Mein (1962), Throne, et al. (1965) or Koh and Madow (1967) who found mean PPVT MAs to be significantly higher than mean Stanford-Binet MAs in school age children.

PPVT and Stanford-Binet IQs in this study showed a greater strength of relationship than correlations found in previous studies which were in the .40 to .59 range (Dunn & Brooks, 1960; Hammil, 1965; Rice and Brown, 1967; Brown and Rice, 1967; Zunich and Tolley, 1968; Mueller, 1968; Wolf, 1971). The variance of the IQs in these previous studies were, without exception, more restricted than in the present study. The correlation between IQs in the present study, however, was less than correlations in the .71 to .80 range reported by Kicklighter (1966), McArthur & Wakefield (1968), and Shotwell (1969).

For the total sample, the mean PPVT IQ was found to be 2.6 points higher than the mean 1960 Stanford-Binet IQ, a significant difference. This was consistent with the findings of other studies of school age children (Rice and Brown, 1967; Brown and Rice, 1967; Zunich and Tolley, 1968; Wolf, 1971) which also found PPVT IQs to be significantly higher than Stanford-Binet IQs and inconsistent with a study by Kicklighter (1966) who found no significant difference.

In a school age population with characteristics similar to the sample used in this study, it appears that the practitioner can use the PPVT as a screening device to obtain rough estimates of either 1960 or 1972 Revised Stanford MAs and IQs. The PPVT appears to be somewhat better suited to predicting Stanford-Binet MAs than IQs. Although not in the original scope of this study, the following correction factors for predicting Stanford-Binet variables from PPVT variables are offered.

To predict a subject's Stanford-Binet MA in months, his PPVT MA in months should be multiplied by .62 (slope of the relationship between the two variables) and 36.2 months (intercept of the relationship between the two variables) should be added to the product. The chances are about 2 out of 3 that this corrected PPVT MA will be within 12.3 MA months of the subject's Stanford-Binet MA.

To predict a subject's 1960 Revised Stanford-Binet IQ, his PPVT IQ should be multiplied by .67 (slope of the relationship between the two variables) and 24.2 points (intercept of the relationship between the two variables) should be added to the product. The chances are about 2 out of 3 that this corrected PPVT IQ will be within 11.7 points of the IQ the subject would obtain on the 1960 Revised Stanford-Binet.

To predict a subject's 1972 Revised Stanford-Binet IQ, his PPVT IQ should be multiplied by .64 (slope of the relationship between the two variables) and 25.3 points (intercept of the relationship between the two variables) should be added to the product. The chances are about 2 out of 3 that this corrected PPVT IQ will be within 11.7 points of the IQ the subject would obtain on the 1972 Revised Stanford-Binet.

The results of this study would suggest that the PPVT be used for screening purposes only and even then with caution. A restandardization of the PPVT on a sample more representative of the U. S. population would appear to be in order and might improve the efficiency of the PPVT in predicting Stanford-Binet IQs.

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